Unit-I

**Introduction:** Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation

**Solution of Algebraic and Transcendental Equation:**
Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Muller’s method, Rate of convergence of Iterative methods, Polynomial Equations.

Unit-II

**Interpolation:** Finite Differences, Difference tables
Polynomial Interpolation: Newton’s forward and backward formula
Central Difference Formulae: Gauss forward and backward formula, Stirling’s, Bessel’s, Everett’s formula.
Interpolation with unequal intervals: Lagrange’s Interpolation, Newton Divided difference formula, Hermite’s Interpolation,

Unit-III

**Numerical Integration and Differentiation:** Introduction, Numerical differentiation
Numerical Integration: Trapezoidal rule, Simpson’s 1/3 and 3/8 rule, Boole’s rule, Waddle’s rule.

Unit-IV

**Solution of differential Equations:** Picard’s Method, Euler’s Method, Taylor’s Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution

Unit-V

**Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and Non linear Regression, Multiple regression, Statistical Quality Control methods.

References:
7. Francis Scheld, ” Numerical Analysis”, TMH

TEE 303

NETWORK ANALYSIS AND SYNTHESIS

<table>
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<tr>
<th>Unit – I :</th>
<th>7</th>
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<tr>
<td>Graph Theory : Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.</td>
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<th>Unit – III :</th>
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<tr>
<td>Network Functions : Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots.</td>
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<th>Unit – IV :</th>
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<tr>
<td>Two Port Networks: Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port</td>
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Unit – V :

(a) Network Synthesis :
Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters :
Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, highpass, band pass, band elimination filters.

Text Books:
2. D.Roy Choudhary,”Networks and Systems” Wiley Eastern Ltd.

Reference Books :
8. Ram Kalyan, Linear Circuits Oxford University Press.

TCS-301

DISCRETE STRUCTURES

L T P
3 1 0

Unit-I:
Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.
Theorem proving Techniques: mathematical induction (simple and strong), pigeonhole principle, prove by contradiction.

Unit-II:
Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian
group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Unit-III:

**Posets, Hasse Diagram and Lattices:** Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded I and complemented lattices.

**Boolean Algebra:** Basic definitions, sum of products and product of sums, form in Boolean Algebra, Logic gates and Karnaugh maps.

**Tree:** Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

Unit-IV:

**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

Unit-V:

**Combinatorics & Graphs:** Recurrence Relation, Generating function., Simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.

**Text books and Supplementary reading:**
4. Deo, Narsingh, “Graph Theory With application to Engineering and Computer.Science.”, PHI.

TCS 302

**DATA STRUCTURES USING - C**

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Unit - I

**Introduction:** Basic Terminology, Elementary Data Organization, Structure operations,
Algorithm Complexity and Time-Space trade-off

**Arrays:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.


**Recursion:** Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion, Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

**UNIT - II**

**Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues.

**Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

**UNIT – III**

**Trees:** Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

**Searching and Hashing:** Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

**UNIT – IV**

**Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

**Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

**UNIT - V**


**File Structures:** Physical Storage Media File Organization, Organization of records into Blocks,
Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

**Reference text books:**

**Supplementary reference books:**

**TEC-302**

**SWITCHING THEORY**

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**Unit-I : Introduction**
Characteristics of digital system, Types of Digital circuits, Number system: Direct conversion between bases Negative numbers & BCD and their arithmetic’s, Boolean Algebra, Minimization of Boolean Functions :Map & Tabular method upto 6 variable and multiple output circuits Error detecting & correcting codes, Hamming & cyclic codes.  6

**Unit-II : Combinational Logic Circuits**
Design Procedure, Adders, subtractors & code conversion, Multiplexers/ Demultiplexers, encoder / decoders, decimal adders & amplitude comparators, ROM as decoder, PLA & PAL.  6

**Unit-III : Sequential Logic Circuits**

**Algorithm State Machine:** ASM chart, Timing considerations, Control Implementation Design with Multiplexers, PLA control

**Asynchronous Sequential Circuits:** Analysis Procedure Reduction of state & flow
Unit-IV : Logic Families

Diode, BJT & MOS as a switching element concept of transfer characteristics, input characteristics and output characteristics of logic gates, Fan-in, Fan-out, Noise margin, circuit concept and comparison of various logic families: TTL, IIL, ECL, NMOS, CMOS Tri-state logic, open collector output, Interfacing between logic families, packing density, power consumption & gate delay.

Unit-V : Hazard and Fault Detection

Static and dynamic Hazard : Gate delay, Generation of spikes, Determination of hazard in combinational circuits, Fault detection methods: Fault Table & Path sensitizing methods.

Unit-VI : Memories

Sequential, Random Access, NMOS & CMOS Static and Dynamic Memory elements, one and multi-dimensional selection arrangement, Read-only memories, Formation of memory banks.

Text Books :
1. Digital Design by M Moris Mano, 2nd Edn.PHI
2. Introduction to Digital Microelectronic Circuits, by Gopalan, TMH

Reference Books :
1. Switching Circuit & Logic Design by Hill & Peterson, Wiley

TEE 353

NETWORK LAB

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Note : Minimum eight experiments are to be performed from the following list.
1. Verification of principle of superposition with dc and ac sources
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin’s theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of $Z$ and $h$ parameters (dc only) for a network and computation of $Y$ and $ABCD$ parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9. Determination of image impedance and characteristic impedance of $T$ and $\Pi$ networks, using O.C. and S.C. tests
   Write Demo for the following (in Ms-Power point)
10. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade also study loading effect in cascade
12. College may add any three experiments in the above list.

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TCS 351

NUMERICAL TECHNIQUES LAB

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Write Programs in ‘C’ Language:
1. To deduce error envolved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton’s Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel’s, Sterling’s and Evertt’s Interpolation formula
5. To implement Newton’s Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of $R^2$ for at least two independent variables.

TCS 352

DATA STRUCTURES LAB

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Write Program in C or C++ for following.

- Array implementation of Stack, Queue, Circular Queue, List.
- Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
- Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
- Implementation of Searching and Sorting Algorithms.
- Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.

TEC-352

DIGITAL ELECTRONICS LAB

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1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
5. Transfer characteristics of CMOS inverters series and CD40 series and estimation of Gate delay of CD40 series CMOS inverter.
7. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
10. Modulo N counter using programmable counter 74190.

TCS 401

COMPUTER ORGANIZATION

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Unit-I

Unit-II
Control Design:
Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

Unit-III
Processor Design:
Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

Unit-IV
Input-Output Organization:
I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

Unit-V
Memory Organization:
Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 2^{1/2}D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.
Text Book: 1. Computer System Architecture, M. Mano (PHI)
2. Structured Computer Organization, Tannenbaum (PHI)
3. Computer Organization, Stallings (PHI)

TCS 402

DATABASE MANAGEMENT SYSTEM

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Unit- I

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

Data Modeling using the Entity Relationship Model:
ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit- II

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.

Unit- III

Data Base Design & Normalization:
Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion
dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Unit- IV**

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

**Unit- V**

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

**Text Books**

1. Date C J, “An Introduction To Database System”, Addision Wesley

**References**


**TCS 403**

**OBJECT ORIENTED SYSTEMS**

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**Unit – I**

**Object Modeling:** Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

**Unit – II**

**Dynamic Modeling:** Events and states, operations, nested state diagrams and concurrency,
advanced dynamic modeling concepts, a sample dynamic model.

Unit – III

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

Unit – IV


Unit – V

Software Development using Java:
Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

Text Books:
3. E. Balagurusamy, “Programming in JAVA”, TMH.

References:
2. Bjarne Stroustrup, “C++ Programming Language”, Addison Wesley

TCS-404

SOFTWARE ENGINEERING

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Unit-I: Introduction


**Unit-II: Software Requirement Specifications (SRS)**


**Unit-III: Software Design**


**Unit-IV: Software Testing**


**Unit-V: Software Maintenance and Software Project Management**


Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.
Reference Books:
5. Ian Sommerville, Software Engineering, Addison Wesley.
6. Pankaj Jalote, Software Engineering, Narosa Publication

TCS 405
THEORY OF AUTOMATA & FORMAL LANGUAGES
L T P
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Unit – I
Introduction to defining language, Kleene closures, Arithmetic expressions, defining grammar, Chomsky hierarchy, Finite Automata (FA), Transition graph, generalized transition graph.

Unit – II
Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA), Construction of DFA from NFA and optimization, FA with output: Moore machine, Mealy machine and Equivalence, Applications and Limitation of FA

Unit – III
Arden Theorem, Pumping Lemma for regular expressions, Myhill-Nerode theorem, Context free grammar: Ambiguity, Simplification of CFGs, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.

Unit – IV
Push Down Automata (PDA): Description and definition, Working of PDA, Acceptance of a string by PDA, PDA and CFG, Introduction to auxiliary PDA and Two stack PDA.

Unit – V
Turing machines (TM): Basic model, definition and representation, Language acceptance by TM, TM and Type – 0 grammar, Halting problem of TM, Modifications in TM,
Universal TM, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church’s Thesis, Recursive function theory, Godel Numbering.

Text Books and References:
3. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH
6. Kumar Rajendra, “Theory of Automata (Languages and Computation)”, PPM

COMPUTER ORGANIZATION LAB

TCS 451

2. Experiments with clocked Flip-Flop.
3. Design of Counters.
4. Bread Board implementation of counters & shift registers.
5. Implementation of Arithmetic algorithms.
6. Bread Board implementation of Adder/Subtractor (Half, Full)
7. Bread Board implementation of Binary Adder.
8. Bread Board implementation of Seven Segment Display.

Institute may also develop the experiment based on the infrastructure available with them.

TCS 452

Java Programming LAB

1. Write a program in Java for illustrating overloading, over riding and various forms of inheritance.
2. Write programs to create packages and multiple threads in Java.
3. Write programs in Java for event handling Mouse and Keyboard events.
4. Using Layout Manager create different applications.
5. Write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames, and Menus using swing/AWT.
6. Using Java create Applets.
8. Write a program in Java to read data from disk file.

TCS 453

Software Engineering LAB

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1. Program for configuration Management.
2. Perform SA/SD for the following software.
   - Hotel Automation System
   - Book Shop Automation Software
   - Word processing Software
   - Software Component Cataloguing Software.
3. Design and development of test cases for testing.
5. Development of Software tool for Halstead Analysis.
6. Perform Cost/Benefit analysis.
7. Illustration of various activities of Software development using MS Project 2000.
8. Lab exercise involving development of various practical applications using software like VJ++VB, SYBASE, JDK.
   [Students are to be given a major assignment to be completed using one or more of these tools, Student’s exposure to any CASE tool is desirable]
The Queries to be implemented on DBMS by using SQL.

1. Write the queries for Data Definition and Data Manipulation language.
2. Write SQL queries using Logical operators ( =, <, >, etc.).
3. Write SQL queries using SQL operators (Between…. AND, IN(List), Like, ISNULL and also with negating expressions).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.).
6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join, Outer Join)
7. Write SQL queries for sub queries, nested queries.
8. Write programs by the use of PL/SQL.
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
10. Create VIEWS, CURSORS, and TRIGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS.

* Students are advised to use Developer 2000/Oracle-9i version or other latest version for above listed experiments. However depending upon the availability of software’s, students may use Power Builder /SQL SERVER. Mini Project may also be planned & carried out through out the semester to understand the important various concepts of Database.
U.P. TECHNICAL UNIVERSITY
LUCKNOW

Revised Syllabus

2nd Year (3rd & 4th Semester)
[Effective from the session 2005-06]

B.TECH. COMPUTER SCIENCE AND
ENGG.
& INFORMATION TECHNOLOGY